

A REVIEW OF THE SOUTH PACIFIC GENUS *AUSTROME GALOMUS*
ESBEN-PETERSEN (NEUROPTERA: HEMEROBIIDAE) WITH
A DESCRIPTION OF A NEW SPECIES FROM RAPA

JOHN D. OSWALD

Department of Entomology, Comstock Hall, Cornell University, Ithaca, New York
14853-0999.

Abstract.—The hemerobiid genus *Austromegalomus* Esben-Petersen is reviewed. *Austromegalomus* and its type species *A. brunneus* are redescribed and *A. insulanus* is described as new. Figures, known distributions and a key to the two recognized species are provided. Several shared characters of the male ectoprocts, mediuncus and parameres suggest that the genera *Austromegalomus*, *Conchopterella* and *Drepanacra* are closely related.

The genus *Austromegalomus* Esben-Petersen, 1935, was proposed to accommodate the single species *A. brunneus* Esben-Petersen which was described in the same paper from three male specimens collected on the South Pacific island of Tahiti. Until now no additional specimens or species of *Austromegalomus* have been recorded in the literature. In this paper *Austromegalomus insulanus* is described as new, from 20 specimens collected on the island of Rapa located approximately 1200 km (750 mi.) SSE of Tahiti, and the genus *Austromegalomus* and the male of *A. brunneus* are redescribed.

As with many early hemerobiid descriptions, the original descriptions of *Austromegalomus* and *A. brunneus* are based almost entirely upon venational characters. *Austromegalomus insulanus* is shown here to exhibit a wide range of intraspecific variation in a variety of forewing venational traits and venation is judged inadequate to confidently separate the two species. The descriptions presented here emphasize characters of the male genitalia.

Intraindividual, as well as interindividual, variation in venational characters is

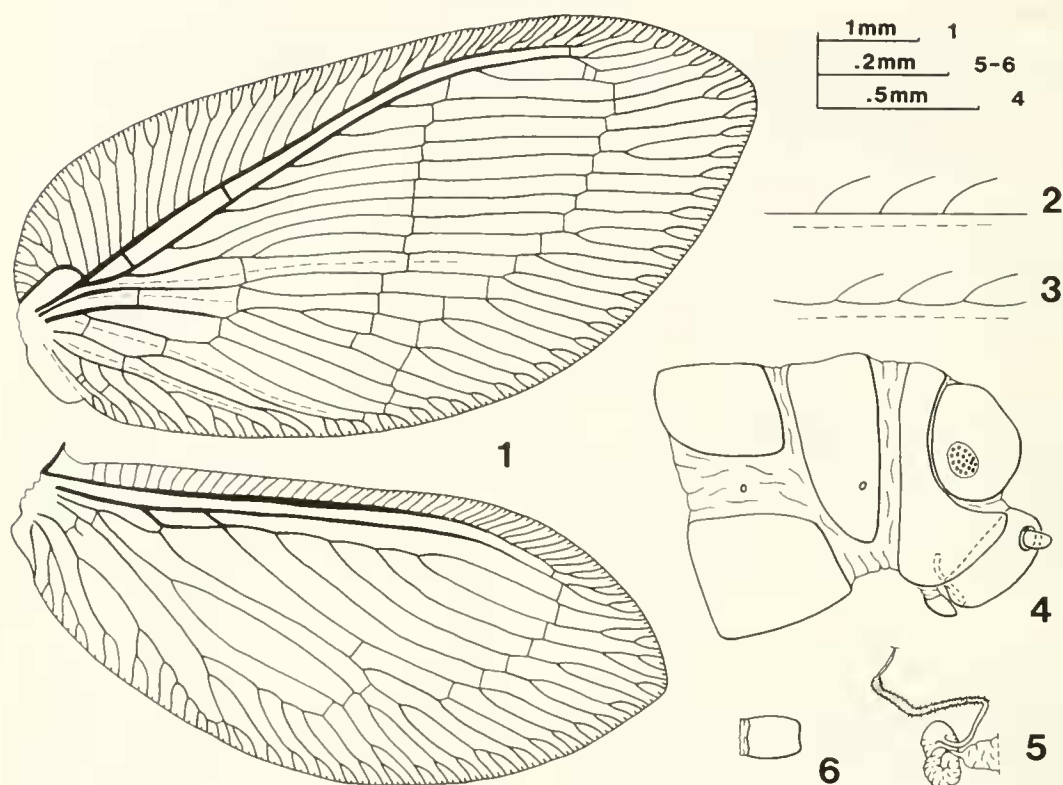
common in *Austromegalomus*. In tabulating the variability of several forewing venational traits, both forewings of each individual were scored for each trait. Estimates of mean forewing length were based on measurements of a single forewing of each specimen. Consequently, the sample sizes given in the species descriptions for venational traits are twice those given for estimates of mean forewing lengths.

Austromegalomus Esben-Petersen

Austromegalomus Esben-Petersen, 1935: 139. Type species: *Austromegalomus brunneus* Esben-Petersen, 1935: 140, by original designation.

Diagnosis.—*Head*: Temporal sutures well developed, marked internally by prominent costae; epicranial suture absent; labial palp three segmented, distal segment longest and with an apical subsegment, palpmacula present; maxillary palp five segmented, distal segment longest and with an apical subsegment.

Forewing: Length 5-9 mm, hind margin rounded, apex broadly pointed; costal area



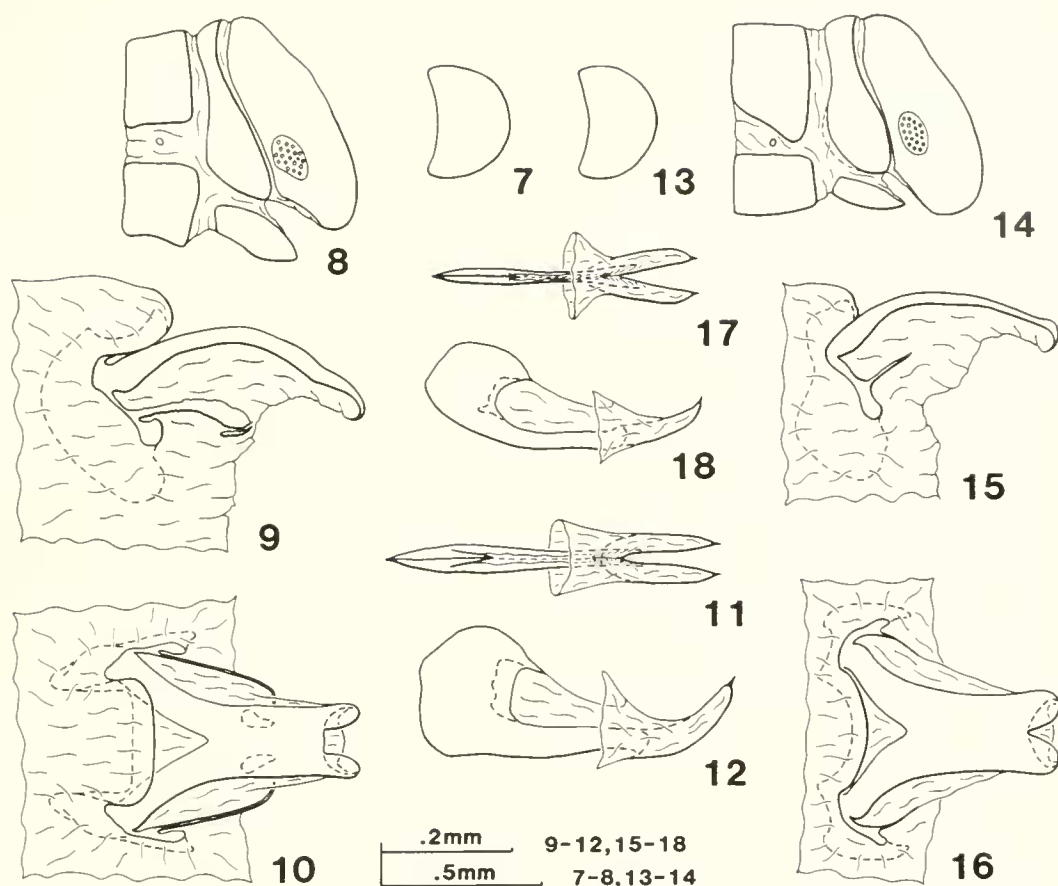
Figs. 1-6. *Austromegalomus insulanus*. 1, venation of forewing and hindwing. 2-3, two possible states of the first (proximal) oblique branch of the forewing radius (diagrammatic). 4-6. Female. 4, apex of abdomen (lateral view). 5, spermatheca and apex of bursa. 6, subgenital (ventral view).

broad proximally, recurrent vein pectinately branched; proximal half of subcostal space with 2 crossveins (the distal of these rarely absent); radius with 4-10 oblique branches; 2 well developed, posteriorly convergent, gradate series in outer half of wing.

Hindwing: Radius with 2 oblique branches; Cu2 frequently, though not always, traceable to near the posterior margin either as a distinct or indistinct vein or a row of setae; outer gradate series well developed; inner gradate series with 1-3 crossveins or absent.

Male genitalia: Tergite nine a sclerotized arch, lateral lobes dilated ventrally; sternite nine in ventral view a remiform plate (Figs. 7, 13), shallowly arched in anterior view; ectoproct elongate oval, without narrowed projecting lobes; gonarcus with arms of

moderate size the greater part of which project free into body cavity, exposed surface limited to a narrow strip to which the mediuncus and epimeres are fused; mediuncus a rigid plate dorsal to epimeres and parameres, bilobed proximally and distally, longitudinal midline shallowly depressed, proximal lobes strongly divergent and fused to gonarcus at a pair of widely separated points on opposite sides of gonarcus bridge, medial margins of proximal lobes and posterior margin of gonarcus bridge enclosing a triangular membranous fenestra; epimeres a pair of elongate strips of sclerotized membrane lying in the membranous sack supported dorsally by the mediuncus, fused to gonarcus ventral to fusion of mediuncus with gonarcus; parameres with internal end of apophysis proxima enlarged in lateral view,



Figs. 7-18. 7-12. *Austromegalomus brunneus*, male. 7, ninth sternite (ventral view). 8, apex of abdomen (lateral view). 9, gonarcus, mediuncus and epimere (lateral view). 10, gonarcus, mediuncus and epimere (dorsal view). 11, parameres (dorsal view). 12, parameres (lateral view). 13-18. *A. insulanus*, male. 13, ninth sternite (ventral view). 14, apex of abdomen (lateral view). 15, gonarcus, mediuncus and epimere (lateral view). 16, gonarcus, mediuncus and epimere (dorsal view). 17, parameres (dorsal view). 18, parameres (lateral view).

external lobes narrow and linear in dorsal view but with their apices upturned in lateral view, medioventral surfaces of lobes sclerotized, laterodorsal aspects membranous.

Female genitalia: See below under *A. insulanus*.

Natural history and immature stages.—Unknown.

Distribution.—Known only from the French Polynesian islands of Tahiti and Rapa.

Etymology.—Name unexplained but almost certainly from the Latin “australis,”

southern, and “*Megalomus*,” a hemerobiid genus to which Esben-Petersen allied *Austromegalomus*. Gender: masculine.

Discussion.—Esben-Petersen diagnosed *Austromegalomus* by the branching arrangement of the first oblique branch of the radius (“basal Rs” of Esben-Petersen). In *Austromegalomus* the vein track which anteriorly parallels the median flexion line is nearly straight. The curvature of vein segments confluent at forks along this track are usually somewhat asymmetric. The branches originating at these forks tend to form a linear series on the anterior side of the track

(Fig. 2). In an alternate state found in many other hemerobiid genera, the vein forks along this track are more symmetric giving the track a more or less undulate appearance (Fig. 3). Though these states are rather distinctive when viewed as the opposite ends of a morphocline, intraspecific variation within *A. insulanus* encompasses both states. Too few specimens are available to adequately assess the degree of intraspecific variation of this trait in *A. brunneus*. Furthermore, as pointed out by Esben-Petersen (1935) and Handschin (1955), similar asymmetric patterns of veins along this track are found in other hemerobiid genera (e.g. *Drepanacra* and *Conchopterella*). For these reasons this character cannot be used as a synapomorphy of *Austromegalomus*. Due to still unresolved questions concerning the homologies and polarities of diagnostic characters of the male genitalia, I have been unable to confidently identify any synapomorphic characters for this taxon.

KEY TO ADULT MALES OF *AUSTROMEALOMUS*

- 1a. Emargination separating distal lobes of mediuncus V-shaped (Fig. 16); gonarcus bridge arcuate in dorsal view (Fig. 16); epimeres short and narrow and not subtended by an accessory sclerite (Fig. 15) (Rapa) *A. insulanus* n. sp.
- 1b. Emargination separating distal lobes of mediuncus quadrate (Fig. 10); gonarcus bridge quadrate (Fig. 10); epimeres long and broad and subtended distally by a small accessory sclerite (Fig. 9) (Tahiti)*A. brunneus* Esben-Petersen

Austromegalomus insulanus, NEW SPECIES Figs. 1-6, 13-18

Diagnosis.—Diagnosed by characters in key couplet 1a. The longer forewing length and the alternating light and dark brown segments of the forewing longitudinal veins may also be diagnostic, though not enough specimens of *A. brunneus* are available to fully assess the potential overlap of these characters with those found in *A. insulanus*.

Description.—*Forewing* (Fig. 1): Length

6.09–8.48 mm (\bar{x} = 7.06, N = 20); longitudinal veins mostly marked with alternating light and dark brown segments, though several specimens (likely teneral) with venation nearly evenly pale; membrane hyaline to brown, darker adjacent to dark vein segments. Venation (Fig. 1, N = 40): Number of subcostal crossveins in proximal half of subcostal space = 2 (39 wings), 3 (1 wing); number of oblique radial branches proximal to stigmal subcostal crossvein = 6 (1 wing), 7 (6 wings), 8 (16 wings), 9 (14 wings), 10 (3 wings); number of inner gradate crossveins anterior to cubitus = 10 (3 wings), 11 (7 wings), 12 (20 wings), 13 (8 wings), 14 (2 wings); number of outer gradate crossveins anterior to cubitus = 11 (2 wings), 12 (2 wings), 13 (8 wings), 14 (15 wings), 15 (13 wings); number of forkings of first oblique radial branch proximal to inner gradate series = 1 (7 wings), 2 (29 wings), 3 (4 wings).

Male genitalia: Apex of abdomen as in Fig. 14. Gonarcus (Figs. 15, 16): gonarcus bridge arcuate in dorsal view. Mediuncus (Figs. 15, 16): distal pair of lobes contiguous medially at their bases. Epimeres (Figs. 15, 16): short and very narrow, weakly tanned and easily overlooked; not extending as far posteriorly as in *A. brunneus* and not subtended distomedially by a pair of accessory sclerites. Parameres (Figs. 17, 18): internal end of apophysis proxima enlarged but not as prominently as in *A. brunneus*; apices of external lobes tipped with a minute spine.

Female genitalia (Figs. 4, 5, 6): Gonapophyses laterales remiform, styli arising dorsad of middle of sclerites; gonapophyses posteriores present as a pair of narrow rods; subgenitale present, attached to ventral body wall by a short membranous tube, apex emarginate; spermatheca composed of a darkly tanned bulb and a pair of ducts—a short duct joining the bulb to the bursa and a longer convoluted duct arising from the distal end of the bulb.

Etymology.—An adjective from the Latin “insula,” island, in reference to the island type locality.

Distribution.—Known only from the type series from the South Pacific island of Rapa (French Polynesia, Austral Islands).

Primary type material examined.—Male holotype (USNM). Verbatim label data: "Rapa/Anatakuri/Bay 28 XI 63," "J. F. G. Clarke/Thelma M. Clarke," "USNM Loan/USNM Loan," "Holotype/Austromegalomus/insulanus Oswald/J. D. Oswald 1987." Condition: Excellent, no parts missing. Genitalia cleared and placed in a glycerin filled microvial pinned below the specimen.

Other material examined.—19 paratypes. RAPA ISLAND: 2 ♂, Anatakuri Bay, 28.xi.1963 (Clarke) (USNM); 3 ♂, 2 ♀, Haurai, 15.x.–3.xii.1963 (Clarke) (USNM); 1 ♂, 1 ♀, Maii Bay, 23.x.1963 (Clarke) (USNM); 2 ♀, Maugaoa, 244 m & 290 m, 18.ix.–23.xi.1963 (Clarke) (USNM); 1 ♂, 1 ♀, Mangaoa [sic = Maugaoa] Pk., NE ridge, 305–366 m, 6.vii.1934 (Zimmerman) (BPBM); 1 ♂, 2 ♀, Maurua, 61 m & 183 m, 25.ix.–25.x.1963 (Clarke) (USNM); 1 ♀, Mt. Ororangi, SE valley, 183–244 m, 3.vii.1934 (Zimmerman) (BPBM); 2 ♀, Point Teakaurae, 61 m, 7.x.1963 (Clarke) (USNM).

Note.—For a general account of the Clarke Expedition to Rapa, including collecting localities and physiography, see Clarke (1971).

***Austromegalomus brunneus* Esben-Petersen**
Figs. 7–12

Austromegalomus brunneus Esben-Petersen, 1935: 140 (original description, figures); Esben-Petersen 1937: 51 (listed); Handschin 1955: 9 (compared to *Conchopterella*).

Diagnosis.—Diagnosed by characters in key couplet 1b. The shorter forewing length and the uniform brown coloration of the forewing longitudinal veins may also be diagnostic, though not enough specimens of *A. brunneus* are available to adequately assess the potential range of intraspecific variation in these characters.

Description.—*Forewing*: Length 5.37–5.56 mm (\bar{x} = 5.47, N = 2); longitudinal

veins uniformly brown, membrane also brown. Venation (N = 4): Number of subcostal crossveins in proximal half of subcostal space = 2 (4 wings); number of oblique radial branches proximal to stigmal subcostal crossvein = 4 (3 wings), 5 (1 wing); number of inner gradate crossveins anterior to cubitus = 8 (1 wing), 9 (1 wing), 10 (2 wings); number of outer gradate crossveins anterior to cubitus = 11 (2 wings), 12 (2 wings); number of forkings of first oblique radial branch proximal to inner gradate series = 3 (4 wings).

Male genitalia: Apex of abdomen as in Fig. 8. Gonarcus (Figs. 9, 10): gonarcus bridge quadrate in dorsal view; anterodorsal region of gonarcus arm broader in lateral view than in *A. insulanus*. Mediuncus (Figs. 9, 10): distal pair of lobes separated medially at their bases by a space about equal to width of each lobe. Epimeres (Fig. 9, 10): prominent, long and broad relative to *A. insulanus*; apex of each epimere subtended medially by a small, weakly sclerotized and poorly delimited accessory sclerite. Parameres (Figs. 11, 12): internal end of apophysis proxima considerably enlarged in lateral view; apices of external lobes tipped with a minute spine.

Female: Unknown.

Etymology.—An adjective from the Latin "brunneus," dusky or tawny, in reference to the brownish coloration of the body and forewing.

Distribution.—Known only from the type series from the South Pacific island of Tahiti (French Polynesia, Society Islands).

Primary type material examined.—Male holotype (BPBM). Verbatim label data: "Society Is./1500'/Tahiti I.," "Fautaua Val./IX-11-28," "A. M. Adamson/Collector," "Pacific Entomological Survey," "TYPE 791," "Austromegalo-/mus brunneus/♂ n. sp./det. Esben-Petersen." Condition: Excellent, only several small pieces of wings missing. Genitalia cleared and placed in a glycerin filled microvial pinned below the specimen.

Other material examined.—One male paratype (BPBM). Collection data same as holotype. A second paratype stated in the original description to have been retained by Esben-Petersen has not been traced.

PHYLOGENETIC POSITION OF *AUSTROMEALOMUS*

The morphology of the male genital structures of *Austromegalomus* suggests that it is closely related to the southern hemisphere genera *Drepanacra* and *Conchopterella*, which are known from the Australian region and the Juan Fernandez islands respectively. This evidence supports the conclusions of Esben-Petersen (1935) and Handschin (1955) based on venational characters. The following three shared traits appear to support the hypothesis that these genera are closely related:

(1) The male ectoprocts are elongate oval without projecting narrow lobes. The ectoprocts of many other hemerobiid genera are variously lobed.

(2) The mediuncus forms a rigid horizontal plate which is bilobed distally and attached to the gonarcus by a pair of widely divergent proximal arms. The full distribution of this state and its possible derivatives within the Hemerobiidae needs additional investigation.

(3) The parameres consist of a prominent, anteriorly projecting apophysis proxima and a pair of small apical lobes. The medioventral surfaces of the apical lobes are sclerotized, the dorsolateral surfaces membranous. The parameres of many other hemerobiid genera possess various other dorsal and/or lateral lobes and patterns of sclerotization.

Though one or more of the preceding characters may in the future prove synapomorphic of a clade (*Austromegalomus* + *Conchopterella* + *Drepanacra*), at present, the polarities of these shared traits in relation to their homologues found in other hemerobiid genera are not known with confidence. Consequently, firm conclusions

about the relative relationships among these three genera are presently impossible.

Currently available comparative analyses of important hemerobiid character complexes (e.g. wing venation and male genitalia) are in most cases insufficiently detailed, with regard to hypotheses of homologies and/or polarities, to allow confident differentiation of synapomorphies and symplesiomorphies. Consequently, it has not been possible to fully assess the status of some *Austromegalomus* character states which might later prove to be useful indicators of phylogenetic relationships.

Several factors have contributed to the dilemma described above. First, no recent comprehensive revision of the Hemerobiidae, with attention to character analysis, is available. Second, many terms widely employed in the current nomenclature of neuropterous genital structures were originally proposed expressly as labels of convenience, without critical investigation of the homologies of the labeled structures. Though some of these terms have apparently been applied to homologous structures (e.g. the gonarcus), others have not (e.g. the mediuncus-arcessus). Uncritical application of existing genitalic terms has hindered the improvement of hypotheses of homology for some genitalic structures.

Most hemerobiid genera are currently diagnosed, at least in part, on the basis of distinctive combinations of male genitalic characters. Given the importance of this character complex, additional comparative morphological studies are needed to clarify the homologies and polarities of genitalic characters. Until such analyses are undertaken, the phylogenetic position of *Austromegalomus*, and many other hemerobiid genera, will likely remain unclear.

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